
Proposed Revision to ORPS Criteria for Hazardous Electrical Energy

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Purpose of this Presentation

- Review the justification for the injury factor (IF) as part of the Electrical Severity Measurement Tool when determining the electrical severity (ES) score for an event.
- Review the assignment of an electrical hazard factor (EHF) for events where an electrically safe work condition (LO/TO) has not been established.
- Propose revised electrical hazardous energy reporting criteria for ORPS determined solely by the ES score of an event using the Electrical Severity Measurement Tool currently in use.

Recap from November 2009 Presentation

- Reviewed problems with current ORPS categorization for electrical incidents
- Proposed a new approach to categorizing electrical incidents in ORPS and to bring reporting into alignment with the Electrical Severity Measurement Tool currently in use.

Need for the Injury Factor (IF)

- The Electrical Severity Ranking Tool was developed by a team of 12 members representing 12 DOE/NNSA sites during the Electrical Safety Improvement Project and later became an EFCOG Electrical Safety Subgroup effort.
- The tool was originally developed to determine the severity of the event. Without the IF, all incidents score very close, with very little spread, and little is learned about the event.
- The tool was tested on over 100 cases, and adjusted to meet everyone's needs. It is a consensus product.
- The tool has been in use by over a dozen major sites, for up to 4 years by some.

Need for the Injury Factor (IF)- cont.

- The tool has now been used on 100s of cases.
- The injury factor was integrated with all other factors to give a measure of the inter dependency of (a) hazard, (b) exposure, and (c) injury.
- To delete the Injury Factor would completely change the historical use of the tool, its current use across the complex, and the usefulness of the tool to the sites.
- Users polled recently are not in favor of deleting the IF.

**Electrical Hazard Factor (EHF)
for Events where an
Electrically Safe Work Condition (LO/TO)
Has Not Been Established**

From NFPA 70E 2009

- **Electrically Safe Work Condition.**

A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ensure the absence of voltage, and grounded if determined necessary.

- Establishing an *electrically safe work condition* is the only work practice that ensures that an electrical injury cannot occur.
- Until the electrically safe work condition exists, a risk of injury from electrical energy exists.

The Tool previously did not assign a hazard factor if hazardous energy was not present

- From the Tool:

*The Electrical Hazard Factor is determined by classifying the source of electrical energy that the worker was **exposed** to during the event and then assigning a value to it, based on the Electrical Hazard Classification Charts found in the back of this document and color coded as shown above.*

- Previous application of the Tool considered an exposure only when energy was present.

Some users have concerns that LOTO events are not captured by the Electrical Severity Measurement Tool

- A recent event at the Idaho National Laboratory's (INL) Advanced Test Reactor (ATR) concerned work performed on a pump that had not been isolated and the only thing preventing an encounter with 480Vac was an open contact in the starting circuit from an uncontrolled level switch.
- A starting circuit contact from a level switch is considered a control device by NFPA 70E (Art 120) and is not allowed to be used as an isolating device
- Keep in mind that the intent of the tool never was to capture inadequate work control, but to develop a consistent measure of exposure.

“Exposed” per NFPA 70E

- NFPA defines **Exposed (as applied to energized electrical conductors or circuit parts)** being capable of being inadvertently touched or approached nearer than a safe distance (Limited Approach Boundary) by a person.
- It is applied to electrical conductors or circuit parts that are not suitably guarded, **isolated**, or insulated.

It has been proposed by some to use the Electrical Severity Measurement Tool to capture lack of adequate LOTO

- *Failure to establish an electrically safe work condition (e.g., lockout/tagout) resulting in the discovery of an incomplete isolation of hazardous electrical energy is considered an exposure.*
- *These events (e.g. the ATR pump) will be assigned an EHF based on the source voltage.*
- *This **does not include** discoveries made by zero-energy checks before work is authorized or administrative errors.*

Proposed Change to Electrical Severity Measurement Tool

Electrical Hazard Factor

blue-no hazard	0
green-low hazard	1
yellow-moderate hazard	10
orange-high hazard	50
red-very high hazard	100

*The Electrical Hazard Factor is determined by classifying the source of electrical energy that the worker was exposed to during the event and then assigning a value to it, based on the **Electrical Hazard Classification Charts** found in the back of this document and color coded as shown above. **Failure to establish an electrically safe work condition (e.g., lockout/tagout) resulting in the discovery of an incomplete isolation of hazardous electrical energy is considered an exposure. This does not include discoveries made by zero-energy checks before work is authorized or administrative errors.***

Justification for Proposed Change

- Incorporates current criteria concerning the “Failure to follow a prescribed hazardous electrical energy control process (e.g., lockout/tagout)” into the Tool and results in a ES score for categorization.

Revised Electrical Hazardous Energy Reporting Criteria for ORPS

Categorizing an Event Using the Tool

- Determined solely by the ES score of an event using the Electrical Severity Measurement Tool currently in use.
- Removes current subjectivity
 - “disturbance”
 - “previously unknown”
 - “mislocated”
 - “site condition”
 - “unexpected discovery”
 - “uncontrolled”

The Tool gives a Reproducible Score

- The Electrical Severity (ES) equation generates scores from 0 to 310,000. This range provides an exponentially rising severity that, when based on a logarithmic scale, breaks down into 4 categories of significance (as shown below) Extreme, High, Medium and Low.

<u>Significance</u>	<u>Electrical Severity (ES)</u>
Extreme	$11,000 \leq ES$
High	$1750 \leq ES < 11,000$
Medium	$30 \leq ES < 1750$
Low	$1 \leq ES < 30$

Categorization as of November 2009

- SC 2 - Exposure to a hazardous electrical energy source with a High Electrical Severity Value ($3301 \leq ES$).
- SC 3 - Exposure to a hazardous electrical energy source with a High Electrical Severity Value ($331 \leq ES < 3300$).
- SC 4 - Exposure to a hazardous electrical energy source with a Medium Electrical Severity Value ($31 \leq ES < 330$)
- SC 3 - Failure of a hazardous electrical energy control process (e.g., lockout/tagout) resulting in the discovery of an incomplete isolation of hazardous electrical energy. This includes discoveries made by zero-energy checks before work is authorized. This does not include administrative errors.
- The ORPS group at that time asked for an SC1 for a fatality.

Proposed Revision to Categorization

- SC 1 - Exposure to a hazardous electrical energy source with a Extreme Electrical Severity Value ($11,000 \leq ES$).
- SC 2 - Exposure to a hazardous electrical energy source with a High Electrical Severity Value ($1750 \leq ES < 11,000$).
- SC 3 - Exposure to a hazardous electrical energy source with a Medium Electrical Severity Value ($31 \leq ES < 1750$)
- **Exposure** - touched or approached nearer than a safe distance by any part of a worker
- **Hazardous Electrical Energy** - defined by electrical hazard classification in the Electrical Severity Measurement Tool.
- **ES** - Score generated by the Electrical Severity Measurement Tool.

Some Examples of Tool Use

- SC1 $\geq 11,000$
21,000 = Very high/ $>600\text{Vac}$ /Dry/PAB/AFB/Shock effects heart
11,000 = Moderate/ 120Vac /Dry/PAB/Fatality.
- SC2 ≥ 1750 - $<11,000$
10,500 = High/ 480Vac /Dry/PAB/AFB/Shock effects heart
9300 = Very high/ $>600\text{Vac}$ /Wet/PAB/AFB/Shock no fibrillation
- SC3 ≥ 31 - < 1750
1400 = Very high/ $>600\text{Vac}$ /Dry/RAB/AFB/No Injury
1200 = High/ 480Vac /Wet/RAB/AFB/No Injury
330 = Moderate/ 120Vac /Dry/PAB/Shock no Fibrillation
210 = Moderate/ 120Vac /Wet/RAB/AFB/NoInjury
- SC4/Non Reportable?? ≤ 30
20 = Moderate/ 120Vac /Dry/LAB/NoInjury

Summary

- Proposed revision to ORPS categorization criteria will allow more consistent, accurate and reproducible categorization of electrical incidents.
- Utilizes recent progress made on a graded ranking process based on national codes and standards.

If you have Questions

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